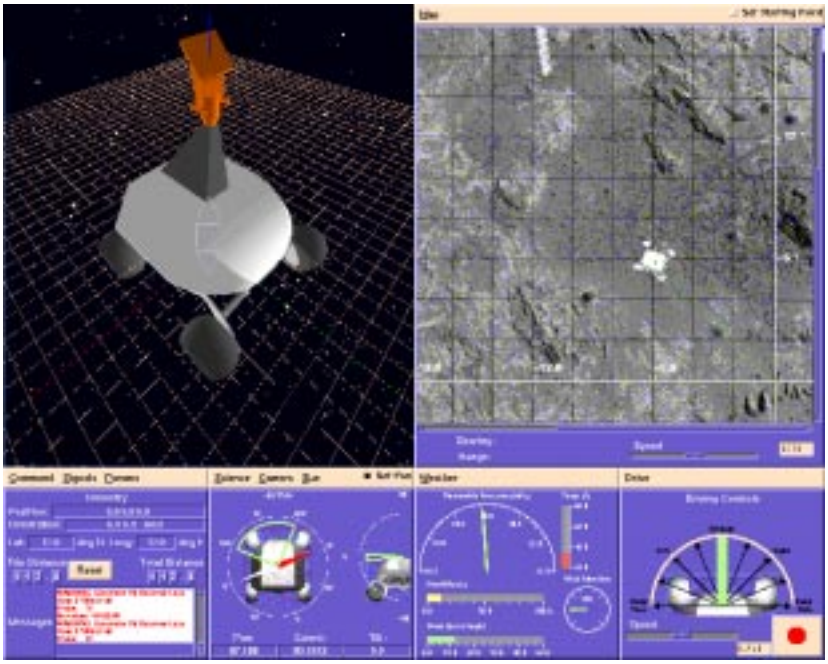
The Atacama Desert Trek

http://img.arc.nasa.gov/Nomad

NASA Ames Intelligent Mechanisms Group

The Intelligent Mechanisms Group (IMG) at NASA Ames Research Center advances the science and technology of planetary and space-based robotic systems. We focus supervised autonomy and develop robot architectures and operator interfaces appropriate to this level of telerobotic control. Our research is grounded by building intelligent mechanisms and then testing them in realistic field experiments.

We have partnered with the Field Robotics Center at Carnegie Mellon University to create and operate the Nomad robotic system and will perform a field experiment in the Atacama desert in northern Chile beginning in June 1997. The IMG has integrated telemetry software to transmit imagery and robot status information to remote operators, developed a operator interface to visualize the robot's state and command its actions, and integrated a telepresence interface to immerse the operator in the live imagery from the Nomad's cameras.



Virtual Dashboard Interface

The IMG has created an operator interface, called the *virtual dashboard*, for driving the Nomad robot. Our intention is always to develop operator interfaces that are simple and intuitive to use, provide compelling interaction with the remote robot explorer, and result in more efficient and effective science operations.

The virtual dashboard provides a clear visualization of the robot's state in recognizeable graphical and numeric formats. The position is plotted on aerial images, and the pose is rendered in 3-D; all updated in real-time. An operator can quickly assess Nomad's condition and command it, using a mouse to click the direction to steer or point cameras.

Telepresence Interface

Nomad carries a unique panospheric camera with a 360 degree field-of-view, which we use to give the operator a sense of presence at the robot's location. The IMG has integrated software to take an image, compress it (using a wavelet technique developed by Summus), decompose it into packets, transmit these to remote computers (using NDDS messages by Real-Time Innovations), reconstruct and finally decompress it into the original image. Then, using software developed with the GROK Lab at the University of Iowa, the image is dewarped and displayed. Operators can look around, from the Nomad's perspective, with smooth and natural motions, and with new images arriving many times per second. This telepresent view will be displayed on a 220 degree, 35 foot-wide screen at the Carnegie Science Center in Pittsburgh.

Science Field Experiment

Nomad will be controlled remotely throughout its trek from virtual dashboards at the Carnegie Science Center and NASA Ames Research Center. The Atacama Desert Trek is designed to demonstrate and validate enabling technologies for robotic planetary exploration. NASA Ames will conduct a week of experiments to test these technologies at performing real remote science and to train planetary scienctists with these new tools. We will involve the public in outreach activities, and provide Nomad's data archive (telemetry, imagery, and commentary) live on the internet.

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